AMENDMENTS TO THE SPECIFICATION

In the Title of the Specification

Please amend the title of the specification as follows:

TRANSMISSION ~~SIGNAL PRODUCTION~~ METHOD, COMMUNICATION METHOD, AND DATE STRUCTURE OF TRANSMISSION SIGNAL.

Please replace the paragraph beginning at page 1, line 5, with the following rewritten paragraph:

The present invention relates to a transmission ~~signal production~~ method, a communication method ~~using the transmission signal,~~ and a data structure of the transmission signal and, more particularly, is advantageous to a multi-path environment such as that of mobile communication.

Please replace the paragraph beginning at page 4, line 4, with the following rewritten paragraph:

When transmission data is modulated via spread spectrum, a spreading sequence itself is processed in the prior art to make the periodic spectrum of a transmission signal a non-correlated spectrum. By contrast, when transmission data is modulated via spread spectrum according to the present invention, not the spreading sequence itself is processed as in the prior art but a ~~transmission~~ data sequence is processed to make the periodic spectrum of the transmission signal a non-correlated spectrum. Making the periodic spectrum of the transmission signal a non-correlated spectrum reduces an increase in the amplitude of a signal and reduces the dynamic range of an amplifier on the receiving side.

Please replace the paragraph beginning at page 4, line 21, with the following rewritten paragraph:

In a first mode of the transmission ~~signal production~~ method according to the present invention,

a plurality of finite-length signals of a length Nm

$S_{A,X}=(x_0A, 0\ldots0, x_1A, 0\ldots0, x_2A, 0\ldots0, \ldots, x_{m-1}A, 0\ldots0)$

$S_{B,Y}=(y_0B, 0\ldots0, y_1B, 0\ldots0, y_2B, 0\ldots0, \ldots, y_{m-1}B, 0\ldots0)$

...
are created using a plurality of data sequences

$A=(a_0a_1\ldots a_{N-1}), B=(b_0b_1\ldots b_{N-1}), \ldots$ and

a plurality of coefficient sequences

$X=(x_0x_1\ldots x_{m-1}), Y=(y_0y_1\ldots y_{m-1}), \ldots;$

each finite-length signal of the finite-length signals $S_{A,X}, S_{B,Y}, \ldots$ is repeated to produce a pseudo periodic signal $\ldots, S_{A,X}, S_{A,X}, S_{A,X} \ldots, \ldots, S_{B,Y}, S_{B,Y}, S_{B,Y}, \ldots, \ldots$; and a part is cut out from this pseudo periodic signal to produce a signal of a predetermined length for making this signal a transmission signal ~~a coefficient sequence of a spreading sequence is sequentially shifted one pitch at a time, transmission data is multiplied by the plurality of coefficient sequences to produce a plurality of transmission data, and the plurality of produced transmission data are added up to produce a transmission data sequence. Alternatively, the coefficient sequence of the spreading sequence is multiplied by the transmission data, the result is sequentially shifted, one pitch at a time, to produce a plurality of transmission data, and the plurality of produced transmission data are added up to produce a transmission data sequence~~.

Please replace the paragraph beginning at page 5, line 3, with the following rewritten paragraph:

In a second mode of the transmission ~~signal production~~ method according to the present invention, ~~transmission data is multiplied by a coefficient sequence of a spreading sequence to produce a finite-length signal and this finite-length signal is repeated an infinite number of times to produce an infinite-length signal. Transmission data, which is longer than the coefficient sequence, is cut out from this infinite-length signal to produce a transmission data sequence~~ a plurality of signals of a predetermined length, cut out from the pseudo periodic signal produced from different finite-length signals, are added up to make the added-up signal to produce a transmission signal. In the first or second mode of transmission signal production described above, ~~transmission~~ a data sequence is included into the spreading sequence.

Please replace the paragraph beginning at page 5, line 14, with the following rewritten paragraph:

In another mode of the transmission ~~signal production~~ method according to the present invention, a plurality of transmission ~~data sequences~~ signals are produced using different coefficient sequences when the first or second mode ~~of the transmission signal production method~~ described above is used for producing a transmission ~~data sequence~~ signal and, in an arbitrary combination of two different transmission ~~data sequences~~ signals, a periodic cross-coefficient function of the transmission data of the transmission signals ~~data sequences~~ is 0 for all shifts. The plurality of transmission ~~data sequences~~ signals are transmitted in parallel so that the periodic spectrums of the transmission ~~data sequences~~ ~~signals~~ have no correlation.

Please replace the paragraph beginning at page 6, line 24, with the following rewritten paragraph:

The communication method according to the present invention comprises the steps of transmitting the transmission ~~data sequence~~ signal produced in accordance with the transmission ~~signal production~~ method of the present invention and receiving ~~transmission~~ a data sequence via a matched filter corresponding to the coefficient sequence used for the production of the transmission ~~data sequence~~ signal.

Please replace the paragraph beginning at page 6, line 31, with the following rewritten paragraph:

According to the communication method of the present invention, the transmission ~~data sequence~~ signal is used as a pilot signal for measuring multi-path characteristics, and the multi-path characteristics of a transmission path can be obtained by receiving this pilot signal.

Please replace the paragraph beginning at page 7, line 5, with the following rewritten paragraph:

In another mode of the communication method of the present invention, a plurality of transmission ~~data sequences~~ signals are produced using different coefficient sequences and at least one transmission data sequence selected from the transmission ~~data sequences~~ signals is used as the pilot signal with other transmission ~~data sequences~~ signals used as transmission signals for transmitting information. The multi-path characteristics are obtained from the reception signal of the pilot signal, and the multi-path characteristics are removed from the reception signal of the other transmission ~~signal~~ signals using the multi-path characteristics, which are found, to produce transmission data.

Please replace the paragraph beginning at page 7, line 24, with the following rewritten paragraph:

The data structure of a transmission signal according to the present invention comprises ~~a transmission data sequence produced by cutting out transmission data, which is longer than the coefficient sequence, from an infinite-length signal produced by repeating a finite-length signal, produced by multiplying transmission data by the coefficient sequence of a spreading sequence, an infinite number of times~~ a signal of a predetermined length produced in accordance with a method comprising the steps of producing a plurality of finite-length signals of a length Nm $S_{A,X}=(x_0A, 0\ldots0, x_1A, 0\ldots0, x_2A, 0\ldots0, \ldots, x_{m-1}A, 0\ldots0)$, $S_{B,Y}=(y_0B, 0\ldots0, y_1B, 0\ldots0, y_2B, 0\ldots0, \ldots, y_{m-1}B, 0\ldots0)$, ... using a plurality of data sequences $A=(a_0a_1\ldots a_{N-1})$, $B=(b_0b_1\ldots b_{N-1})$, ... and a plurality of coefficient sequences $X=(x_0x_1\ldots x_{m-1})$, $Y=(y_0y_1\ldots y_{m-1})$, ...; repeating each finite-length signal of the finite-length signals S_{AX}, S_{BY}, ... to produce a pseudo periodic signal ..., $S_{A,X}$, $S_{A,X}$, $S_{A,X}$ ..., ..., $S_{B,Y}$, $S_{B,Y}$, $S_{B,Y}$, ..., ...; and cutting out a part from this pseudo periodic signal.

Please replace the paragraph beginning at page 8, line 4, with the following rewritten paragraph:

FIG. 1 is a general diagram showing a transmission ~~signal production~~ method according to the present invention and the data structure of a transmission signal according to the present invention; FIG. 2 is a diagram showing the coefficients of a fourth order DFT matrix; FIG. 3 is a diagram showing the relation between a pilot signal and transmission signals; FIG. 4 is a diagram showing the relation and correlation between transmission signals and detected signals; and FIG. 5 is a diagram showing an example of a signal that uses a complete complementary sequence as the spreading code sequence.

Please replace the paragraph beginning at page 8, line 29, with the following rewritten paragraph:

According to the present invention, a transmission ~~data sequence~~ signal (shown in FIG. 1(c, d)) is produced from ~~transmission~~ a data sequence b (=(b0, b1, b2, b3, ..., bM-1)) (shown in FIG. 1(a)) using a spreading sequence (sequence a(= (a0, a1, ..., aN-1) in FIG. 1(b)), and ~~this transmission data sequence~~ is used as a transmission signal. The length of the spreading sequence is N bits, and the data length of the ~~transmission~~ data sequence b is M bits.

Please replace the paragraph beginning at page 9, line 6, with the following rewritten paragraph:

To produce the transmission ~~data sequence~~ signal B from the ~~transmission~~ data sequence b (b0, b1, b2, b3, ..., bM-1) (shown in FIG. 1(a)), the ~~transmission~~ data sequence (b0, b1, b2, b3, ..., bM-1) is multiplied by the coefficients of the coefficient sequence (a0, a1, ..., aN-1) of the predetermined spreading sequence (shown in FIG. 1(b)) to produce a plurality of transmission ~~data sequence~~ signals B0, B1, ...,BM-1.

Please replace the paragraph beginning at page 9, line 13, with the following rewritten paragraph:

FIG. 1 shows an example of the coefficient sequence (a0, a1, ... , aN-1) of a spreading sequence, that is, (1, 0, ..., 0, j, 0, ..., 0, -1, 0, ..., 0, -j, 0, ..., 0). When the coefficient sequence of this spreading sequence is applied to the ~~transmission~~ data sequence b (b0, b1, b2, b3, ..., bM-1), transmission ~~data~~ signal B0 becomes (b0, 0, ..., 0, jb0, 0, ..., 0, -b0, 0, ..., 0, -jb0, 0, ..., 0) and transmission ~~data~~ signal B1 becomes (b1, 0, ..., 0, jb1, 0, ..., 0, -b1, 0, ...,0, -jb1, 0, ..., 0). The other transmission ~~data~~ signal is also processed in the same manner. The processing in which the ~~transmission~~ data sequence b (=(b0, b1, b2, b3, ..., bN-1)) is multiplied by the coefficients of the coefficient sequence(a0, a1, ..., aN-1) of the predetermined spreading sequence is represented by

the Kronecker product as shown in FIG. 1(b).

Please replace the paragraph beginning at page 9, line 27, with the following rewritten paragraph:

Next, as shown in FIG. 1(c), a plurality of transmission ~~data~~ signals B0, B1, B2, ... , produced by multiplying them by the coefficients, are delayed each for one pitch and then added up to produce the data sequence B (= b + jb – b – jb). In addition, data is added before and after this data sequence B to produce a finite-length periodic sequence. FIG. 1(d) shows a finite-length periodic sequence. As shown in FIG. 1(d), this finite-length periodic sequence is produced by adding the ending data sequence (jb) of the data sequence B to the start of the data sequence B (=b + jb - b –jb) and by adding the starting data sequence (-jb) of the data sequence B to the end of the data sequence B.

Please replace the paragraph beginning at page 10, line 17, with the following rewritten paragraph:

When the ~~transmission~~ data sequence is (1, 0, 0, 0) and the coefficient sequences (1, 1, 1, 1), (1, j, -1, -j), (1, -1, 1, -1), and (1, -j, -1, j) of the rows of the DFT matrix are applied to the transmission data (1, 0, 0, 0), the periodic sequences A – D can be represented by the Kronecker products as shown by expression (1) given below.

Please replace the paragraph beginning at page 11, line 30, with the following rewritten paragraph:

The transmission signal whose transmission data is the finite-length periodic sequence A' can be obtained by a matched filter (matched filter) corresponding to the coefficients of a spreading sequence used for the production of the transmission signal. A matched filter, a filter used for

de-spreading and obtaining the transmission ~~data~~ signal A, is produced corresponding to the coefficients of the spreading sequence used for the production of the transmission ~~data~~ signal A.

Please replace the paragraph beginning at page 19, line 20, with the following rewritten paragraph:

The transmission ~~signal production~~ method, communication method, and the data structure of the transmission signal according to the present invention are advantageous to and ~~are~~ useful for the multi-path environment of mobile communication.